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AMENDED CLAIMS  
31 JAN 2006

[lodged at the International Bureau on 8th November 2004 (08.11.04),  
original claims 1 – 12 replaced by amended claims 1 – 13]

PCT/EP2004/06314

New claims

1. A quantum well structure for the absorption or emission of photons comprising a quantum well layer (7; 107; 207; 301) arranged between two barrier layers (9, 11; 109, 112; 209, 212; 303), wherein at least one of the barrier layers (9, 11; 109, 112; 209, 212; 303) comprises nanostructures (10; 110; 210; 310) which compensate or modulate a lateral homogeneity of the barrier layer (9; 109; 209; 303D), which is present without the nanostructures (10; 110; 210; 310), characterised in that the quantum well layer (7; 107; 207; 301) is in the form of an absorption or emission layer for the absorption or emission of the photons.

2. A quantum well structure as set forth in claim 1 characterised in that the quantum well layer (7; 107; 207; 301) comprises an energy band with energy levels of differing energy, wherein the energy values of the energy levels are so adjusted that the absorption or emission of photons occurs with a given wavelength.

3. A quantum well structure as set forth in claim 1 or claim 2 characterised in that self-organised three-dimensional structures (10; 110; 210; 310) are present as nanostructures.

4. A quantum well structure as set forth in claim 3 characterised in that the self-organised three-dimensional structures (10; 110; 210; 310) are made from a material which has a markedly greater lattice constant than the material of the barrier layer (9; 109; 209; 303D).

5. A quantum well structure as set forth in claim 3 or claim 4 characterised in that the self-organised three-dimensional nanostructures (10; 110; 210; 310) are in the form of quantum dots.

6. A quantum well structure as set forth in claim 3 or claim 4 characterised in that the self-organised three-dimensional nanostructures (10; 110; 210; 310) are in the form of quantum wires.

7. A quantum well structure as set forth in one of claims 1 through 6 characterised in that at least one of the barrier layers is in the form of an aluminum arsenide layer (9; 109; 303D) which includes indium arsenide islands (10; 110; 310) as nanostructures.

8. A quantum well structure as set forth in one of claims 1 through 6 characterised in that at least one of the barrier layers is in the form of an indium phosphide layer (209) which includes indium arsenide islands (210) as nanostructures.

9. A quantum well structure as set forth in one of the preceding claims characterised in that it comprises at least two quantum well layers (7; 107; 207; 301) which are each separated from each other at least by a respective barrier layer (9, 11; 109, 112; 209, 212; 303).

10. A quantum well structure as set forth in one of the preceding claims characterised in that the nanostructures (10; 110; 210; 310) are of a dimension of less than 50 nm in at least one lateral direction in which they extend.

11. A quantum well structure as set forth in claim 10 characterised in that the dimension is in the range of between 5 and 15 nm.

12. A quantum well photodetector comprising at least one quantum well structure as set forth in one of claims 1 through 11.

13. A quantum cascade laser comprising at least one quantum well structure as set forth in one of claims 1 through 11.